eminent paleontologists is bound to attract attention from the clear anatomical descriptions of the forms under review and the conservative stand in the matter of conjectural speculations. The book, as the author says, "comprises a series of monographic studies, together with briefer notes and descriptions, of new or little-known amphibians and reptiles from the Permian deposits of Texas and New Mexico."

The sources of material are mainly three: the University of Chicago collection, made in recent years by field parties under the charge of Mr. Paul Miller or the author; earlier collections of the University of Texas, made by Professor E. C. Case; and finally the great Marsh collection in the Peabody Museum at Yale University, which proves an increasingly fruitful field for research as its varied treasures are brought to light. An interesting comment upon our knowledge of reptilian classification shows that the time is not yet ripe to attempt phylogenies of the groups other than the dinosaurs, crocodiles, phytosaurs, pterosaurs and rhynchosaurs, because we are less sure of them than we were a dozen years ago. "The more recent general classifications of the reptiles by Cope, Osborn, Boulenger, and others have offered suggestions of value, but they are by no means the real solutions of the reptilian and amphibian phylogenies. The recent classifications of Jaekel are not to be taken seriously." Certain morphological problems are discussed in the following pages and the author has given what seem to be the legitimate conclusions regarding the immediate relationships of the forms under discussion. The present work, however, is offered more as a contribution to our knowledge of ancient reptiles and amphibians, with such summaries and definitions, based chiefly upon American forms, as our knowledge at hand permits. The illustrations of the work throughout were made by the author.

A summary of the genera from the Texas Permian follows: Amphibia: *Lysorophus, Diplocaulus, Trimerorhachis* (apparently absent from the upper part), *Eryops, Cacops, Dissorophus, Aspidosaurus, Cardiacephalus.* Reptilia: from the uppermost beds, *Labidosaurus, Naosaurus, Dimetrodon;* from lower horizons, *Naosaurus, Dimetrodon, Clepsydrops, Varanosaurus, Trispondylus, Casea, Arœoscelis, Captorhinus, Diadectes, Seymouria,* etc., of which perhaps the most characteristic are *Labidosaurus* of the upper and *Cricotus* of the lower zones. Williston feels confident, however, that no definite line can be made between the two divisions, and that at present Clear Fork can be used in a general way to designate the upper, and Wichita the lower part of the Texas deposits.

Most of the important specimens come from two isolated deposits known as the Cacops and Craddock bone beds, the former of which is among the most remarkable deposits of fossil vertebrates known, especially when one considers the almost universal rarity of Permian remains.

The Cacops deposit lies in the valley of the Wichita in northern Texas about five miles west of the Vernon road, not far from Indian Creek, while the Craddock bone bed lies about six miles northwest of Seymour, also in northern Texas. The Yale material, on the other hand, comes mainly from New Mexico, all of the Marsh types coming from a deposit which Williston has designated the Baldwin bone bed.

The research of Professors Williston and Case is one of great promise, not only in the ultimate clarifying of our vision with regard to the anatomy and relationships of these ancient forms, but in revealing to us the actual stages of transition between two great vertebrate classes, the Amphibia and Reptilia. For his present book Professor Williston deserves our gratitude, and we look forward confidently to still more notable results when his researches shall have been completed.

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Microbiology, for Agricultural and Domestic Science Students. By MARSHALL and others. Philadelphia, P. Blakiston's Son and Co.

In this work, of which Chas. E. Marshall

is editor, there have been brought together and collated as one, a large number of separate articles upon various phases of bacteriology, mycology and protozoology. The plan of the editor has been to have the various phases of these extensive subjects written up by such persons among our American scientists as have made them specialties, and then to have them edited and collated so as to constitute a logical whole. The result has been to produce a very remarkable book. Other books upon bacteriology, because of the many phases of the subject, have the fault of being one-sided, since each author inevitably knows his own phase of the subject best, and not only writes this part best, but is almost sure to exaggerate its importance. If he has been especially interested in the pathological side, pathological bacteriology becomes too prominent, while if he has worked himself upon soils, soil bacteriology becomes over-emphasized. By the plan of Marshall this becomes impossible, since each author is expected to write upon his specialty alone and to give it all the emphasis he can in the space allotted to him. Any error in perspective can thus come only from an error in the space allotted to each subject. In the balancing of the various topics presented in the work excellent judgment is shown, though perhaps, considering its immense importance, comparatively too little space is devoted to pathological microbiology. The result is a book treating of a large variety of subjects and all written by specialists who know their subjects so thoroughly that they can speak with authority. Under these conditions not only are the subjects efficiently handled, but there is a minimum of error, since no part of the book is the product of one writing except on familiar ground.

On the other hand the plan has the disadvantage of showing considerable inequality in the skill of the treatment of its different parts. Twenty different authors can not be equally successful in the presentation of their subject, and no amount of editing can avoid discrepancies in the manner and skill of treatment. Another result has been to produce a book of a size almost unmanageable for its original purpose. Designed as a text-book for agricultural and domestic science students, it has become what might almost be called a collection of monographs. It is a book of 700 pages, of large size, small print, narrow spacing and with matter form condensed to the smallest possible number of words, and together forms a bulk of material practically hopeless to expect an ordinary college class to master. As a book of reference it is invaluable, but the substance is too great to expect it can be handled by any class. But recognizing these limitations, the book becomes a most extremely valuable addition to the literature of bacteriology, perhaps the most valuable single publication that has yet appeared. The various authors are particularly to be thanked for the time and care taken in what must at best be a work of love.

A better idea of the scope of the work may be obtained from the following condensed outline:

Part I. Morphology and culture of microorganisms, including molds (Thom), yeasts (Bioletti), bacteria (Dorset) and protozoa (Todd).

Part II. Physiology of microorganisms (Rahn).
- Nutrition and metabolism.
- Physical influences.
- Chemical influences.
- Mutual influences.

Part III. Applied microbiology, including microbiology of the air (Buchanan), of water (Harrison), sewage (Phelps), the soil (Lipman), of milk (Stocking), of butter and cheese (Hastings), of special dairy products (Stocking), of desiccation of foods (Buchanan), of preservation by heat (Edwards), by cold (MacNeal), by chemicals (MacNeal), food poisoning (MacNeal), alcoholic products (Bioletti), vinegar (Bioletti), other fermented products (Bioletti), vaccines (King), antisera and other products (King), diseases of plants (Sackett), methods and channels of infection in man and animals (McCampbell), immunity and susceptibility (McCampbell), microbial diseases of man and animals by various authors and control of infectious diseases (Hill).

This outline gives an idea of the comprehensiveness with which the subjects are

covered; only an examination of the work itself can show the method of treatment and the completeness with which the many phases of the many-sided microbiology are treated.

The book is well printed, though the type is small and the pages look crowded. There are 128 figures in the book, of widely varying grades of merit. The editing is well done and the errors are few. Whether or not the book will prove useful in classes it will be indispensable for a bacteriologist's book shelves.

H. W. CONN

SPECIAL ARTICLES

STUDIES ON THE WILT DISEASE, OR "FLACHERIA" OF THE GYPSY MOTH

FOR the past six months we have been engaged in a study of the cause and nature of the wilt disease of gypsy moth caterpillars. The disease, so far as we are able to learn, is similar to the one attacking the nun moth (*Lymantria monacha* L.) in Germany. But although the investigations carried on in that country have led usually to negative results so far as the causative agent of the disease is concerned, still the work has been in the main of a scientific character. We are speaking of such work as has been done by Escherich, Prowazek and Tubeuf. This is more than can be said of some of the attempts made in this country and we thoroughly agree with Escherich,[1] who says, in speaking of a recent paper by Mr. William Reiff[2] "Es fehlt also so ziemlich alles, was zu einem wissenschaftlichen Beweis für die behaupteten Zusammenhänge gehört."

Our first attempts were confined to a search for protozoa in the tissues of the caterpillars, and while dissecting and examining these many were seen to contain certain polygonal bodies clustered around their tracheæ. These bodies have a very high refractive index and resist all stains, with the exception of iodine, in which they take on a uniform tint. No definite internal structure can be detected, however, and it finally dawned upon us that we had a case here analogous to the one in the nun moth. Bolle[3] first found these bodies in sick silkworms, and Tubeuf later discovered them in nun moth caterpillars afflicted with the "Wipfelkrankheit," a sickness the symptoms of which seem to be in many respects similar to those of the gypsy moth wilt. Wachtl and Kornauth[4] were the first to realize that the so-called polyhedral bodies have a diagnostic value, for caterpillars afflicted with "Wipfelkrankheit" are never free from them. Wolff[5] thinks that they are reaction-bodies having nothing to do with the cause of the disease. This he believes to be due to the presence of certain bodies called "Chlamydozoa" by Prowazek. Wolbach and McKee,[6] however, have since shown that the "Chlamydozoa" are products of mucous secretions under pathological conditions and not organisms. Escherich and Miyajima[7] resumed the study of the polyhedral bodies and besides presenting many original observations, confirmed Wachtl and Kornauth's results as to the high diagnostic value of these crystal-like aggregates. The figures and descriptions given by the former authors are very good, and we have no reason to doubt that the bodies which we find in the gypsy moth are precisely the same. At the beginning of the infection these polyhedral bodies are few in

[1] *Naturwiss. Zeitschr. für Forst und Landwirtschaft*, Heft 2 u. 3, Feb.–Marz, 1912, p. 85.

[2] "The Wilt Disease, or Flacherie of the Gypsy Moth," published by the Bussey Institution of Harvard University, 1911.

[3] "Der Seidenbau in Japan, nebst einem Anhang: Die Gelb-oder Fettsucht der Seidenraupe, eine parasitäre Krankheit," Budapest, Wien und Leipzig (Hartlebens Verlag), 1898.

[4] "Beiträge zur Kenntnis der Morphologie, Biologie und Pathologie der Nonne," *Mitteil. forstl. Versuchswesen Österreichs*, Heft XVI., Wien, 1893.

[5] "Uber eine neue Krankheit der Raupe von *Bupalus piniarius* L.," *Kaiser Wilhelm-Institutes für Landwirtschaft in Bromberg*, Band III., Heft 2, 1910, s. 69–92.

[6] "The Nature of Trachoma Bodies," *Journ. Med. Research*, n. s., Vol. XIX., No. 2, pp. 259–264, April, 1911.

[7] "Studien über die Wipfelkrankheit der Nonne," *Naturwiss. Zeitschr. für Forst und Landwirtschaft*, Heft 9, 1911, pp. 381–402.